

Occlusal Splint: A Vital Adjunct in Full Mouth Rehabilitation for Cases of Severely Worn Dentition

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ABSTRACT

Introduction: Excessive wear of dentition results in functional disharmony, loss of esthetics, pulpal injuries and compromises longevity of dentition adversely. The etiological factors of tooth wear may be abrasion, attrition, or erosion acting individually or in combination.

Case Report: The present case report emphasizes the use of a 'sectional occlusal verticalization splint', as a guide for full mouth rehabilitation. As the treatment plan envisaged was occlusal rehabilitation using reorganized approach, sectional splint offered the advantage of restoring the exact amount of vertical dimension to which patient had got programmed. The vertical dimension was maintained during various phases of segmental technique using sectional splint.

Conclusion: Although there are plethora of philosophies and techniques available for full mouth rehabilitation there is a limited evidence-based literature on a particular method for exact restoration of vertical dimension. Also, due to presence of many hard and soft tissues variables in human stomatognathic system, making various occlusal records and repeated transfer to mechanical articulator may introduce errors. Therefore, an occlusal 'verticalization splint', well accepted by patients stomatognathic dynamics, may act as the best guide to restore vertical dimension with an added advantage of reduction in errors due to omission of various steps of occlusal recordings, transfers and use of mechanical devices.

Keywords: Occlusal Splint, Mouth Rehabilitation, Severely Worn Dentition

INTRODUCTION

The personality of an individual is often judged by his looks. A beautiful smile is always pleasurable. Excessive tooth wear due to abrasion, attrition and erosion grossly affects the aesthetics of an individual. Also, collapse of occlusion due to wear rarely acts alone and there is always a secondary effect on TMJ or muscles thus affecting the gnathodynamics. Treatment of collapsed vertical dimension is not to increase, but to restore the lost vertical dimension. An important decision before starting full mouth rehabilitation is whether or not to alter existing vertical dimension of occlusion. There are two approaches that may be followed, either confirmative, where vertical dimension is not altered, or 'reorganised', where vertical dimension is required to be altered within permissible limits. For any full mouth rehabilitation case, that involves restoration of vertical dimension of occlusion there is less margin of error and any minor increase within a fraction of a millimetre can prove detrimental to the stomatognathic system. This case report

describes a technique that allows a clinician to establish the exact amount of restoration of vertical dimension using definitive restoration, showing importance of sequential use of occlusal splints and provisional restorations to assess the tolerance of the patient to changes in occlusal vertical dimensions (OVD).

CASE REPORT

Examination:

A 52-year-old male, reported to the Department, with a chief complaint of poor appearance due to worn out teeth and desired restoration of the same. The patient's occlusion was clinically evaluated and a decreased vertical dimension, secondary to bruxism was diagnosed. Bruxism was confirmed by checking pattern of wear facets, muscle hypertrophy and most important Oral hygiene was fair and there were no signs of periodontal affliction. Clinical,



Figure-1: Pre- Treatment

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Figure-2: Crown Lengthening

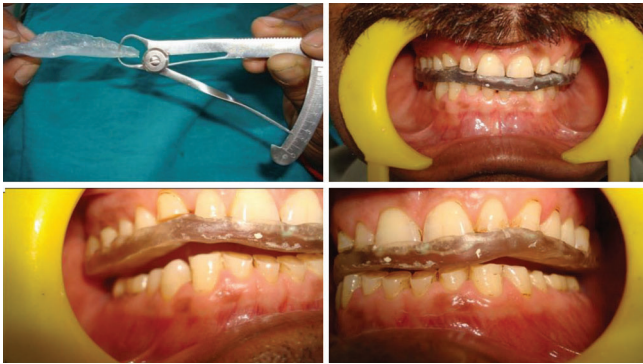


Figure-3: Verticalization Splint



Figure-4: Mock Wax-Up

radiographic examinations and diagnostic casts revealed severe attrition resulting in reduced clinical crown length which was more pronounced in the anterior teeth (Figure 1). On examination of TMJ and muscles of mastication no signs of temporomandibular disorder or soreness of the masticatory muscles was seen. On evaluation of occlusion discrepancy between centric occlusion (CO) and maximum intercuspal position (MIP) was found when he was guided to CR with bimanual technique. To evaluate any alteration in VDO, following aspects were



Figure-5: Splint Modification and Anterior Provisionalization

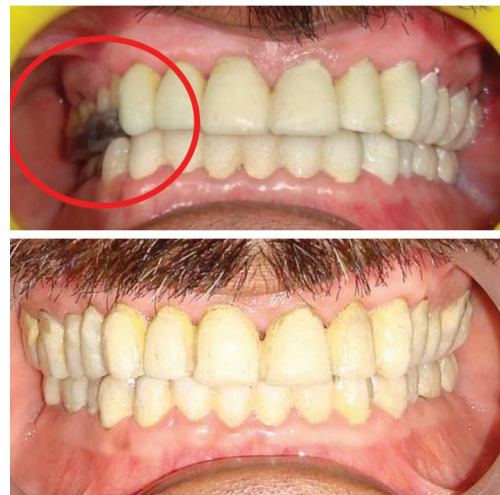


Figure-6: Provisionalization Completed



Figure-7: Definitive Prosthesis in-situ

investigated:

1. Loss of posterior support: there was no loss of posterior tooth support.
2. Pattern of wear: In present case the accelerated wear exceeded the rate of eruption
3. Phonetic evaluation: The patient's increased space altered /s/ sound.



Figure-8: Post Treatment Evaluation

4. Interocclusal rest space: The patient's VD at rest was 60mm and VD at occlusion was 55mm making interocclusal rest space equal to 5-6 mm that was greater than the normal range of value, 2-3 mm.
5. Facial appearance: Features of collapsed vertical dimension showing pseudo mandibular prognathism and reverse smile were present.

Based on clinical and radiographic findings diagnosis of loss of vertical dimension due to excessive wear which falls in Category-I Type of Patient Requiring Occlusal Rehabilitation as per Turner and Missirlian classification was arrived at.

A treatment plan was formulated to restore lost vertical dimension. It involved the following phases:

- I. Patient education and Mouth Preparation phase
- II. Restoration of vertical dimension using splint
- III. Provisionalization
- IV. Definitive prosthesis
- V. Maintenance and After care

Phase I:

Patient education: Patient was educated by explaining in detail steps involved in treatment and his attitude towards various aspects of extensive dental treatment was found to be positive.

Mouth preparation: This included, Oral prophylaxis and crown lengthening of maxillary and mandibular anteriors. (Figure 2)

Phase II:

Verticalization splint fabrication:

Orientation relation and centric relation were recorded and transferred to semiadjustable articulator. Maxillary retained verticalization splint was designed to offer an increase in interocclusal space by 2 - 3 mm. Vertical dimension was evaluated and increased using Niswonger's method, Silverman closest speaking method and aesthetic requirements. The increase in the vertical dimension was introduced by opening the articulator to not more than 5 degree. Increased space was checked at the premolar area, the actual increase was determined as 3 mm anteriorly and 1-2 mm posteriorly. The splint was designed to offer bilateral

contacts of all posterior teeth in centric relation and the anterior guidance so established by the splint disoccluded the posterior teeth in all jaw position except centric relation. (Figure 3)

The adaptation of patient to the restored VDO was evaluated over a period of 5 weeks. This method of restoring VDO with the splint was used to determine acceptance of desirable VDO for fixed interim prostheses. During this period, factors such as muscle tenderness, temporomandibular joint symptom, mastication, range of the mandibular movements, swallowing, speech and patients' comfort were evaluated.

Phase III

Provisionalization:

Diagnostic wax up with occlusal plane developed using custom modified BOPA was used to make templates for provisionals (Figure 4). The occlusal splint was sectioned in anterior portion while keeping posterior portion intact (Figure 5). The posterior portion of splint served as an occlusal ramp which helped in maintaining VDO to which patient was adapted and been evaluated for. After preparation of maxillary and mandibular anterior teeth, the provisional restorations fabricated from tooth moulding material (PMMA) were placed. Next, the previously modified occlusal splint was further divided into right and left sections. Sectioned occlusal splint was placed on maxillary right posterior teeth while teeth preparations and provisionalization on maxillary and mandibular left posteriors were completed. The modified sectional occlusal splint on right side helped in maintaining VDO and transferring records to articulator. Finally, provisional restorations were placed in full arch and luted with temporary cement (Figure 6).

Evaluation of provisionals

Patient was monitored periodically for next 8 weeks. During this period, the patient's aesthetics, TMJ, muscles condition, functions were evaluated. Improvement in mastication, speech, and facial esthetics confirmed the patient's tolerance to the new mandibular position with the restored VDO. The anterior guidance and posterior disclusion on excursive movement were checked. Incisal guidance as established in provisionals was replicated for definitive anterior prosthesis, using customized anterior guide table (Figure 7).

Phase IV:

Definitive Prosthesis

Fabrication of definitive prostheses using the custom anterior guide table resulted in near accurate restorations. To reduce chances of failure due to increased occlusal load as the patient was a known bruxer, cast metal crowns with ceramic buccal facing were planned for all posterior teeth. The posterior teeth were restored segment wise, first completing one side and then the other (Figure 7). Finally, re-evaluation was done during porcelain trial and compared to pre-op records (Figure 8)

Phase V:

Maintenance and aftercare included strict recall schedule of 1 week, 3 week, 3months, 6 months and 1year on yearly basis was followed to evaluate stability and maintenance of

new prosthesis. Oral hygiene instruction and regular check-up were administered.

DISCUSSION

In 1984, Turner and Missirlian⁸ classified the treatment of a severely worn dentition by the amount of the loss of VDO and available space to restore. His classification and conventional treatment, which includes restoring VDO with multiple crown-lengthening procedures, have been widely used till date. However, the etiology of tooth wear is multifactorial and clinical controlled trials of restorative and Prosthodontic approaches are limited in quantity and quality.⁹ In addition, lack of evidence regarding the long-term outcomes of treatment methods and material cause difficulty in clinical decision-making. Because of these unclear guidelines, increase in VD strategy, that is more conservative and reversible, is increasing.^{10,11} A systematic approach for managing tooth wear could lead to a predictable and favourable prognosis towards full mouth rehabilitation situation.

Important philosophy for full mouth rehabilitation are Pankey Mann Schuyler philosophy and Hobo.^{1,2,3,4,5} Pankey Mann Schuyler philosophy is most commonly used practical philosophies for occlusal rehabilitation. In this case, the Pankey-Mann- Schuyler philosophy modified by Dawson was adopted.^{6,7} The anterior teeth were restored first. Mutually protected occlusion was developed in the definitive prostheses. The anterior teeth protected the posterior teeth from excursive force and wear, and posterior teeth supported the occlusal force. This technique used verticalization splint as a guide to initially check the acceptability of new VDO and then introduce the same in permanent restorations. It helps in successful transfer of VDO and occlusal reprogramming done by the help of splint to provisionals and finally to final prosthesis.

The ideal verticalization occlusal splint is made from laboratory-processed heat cure acrylic resin which should cover the occlusal surfaces of all the teeth in one arch. It should provide even simultaneous contacts on closure at centric relation with all opposing teeth and anterior guidance causing immediate disclusion of the posterior teeth and splint surface out side intercuspal position.⁷ Thus, the splint provides the patient with an ideal occlusion with posterior stability and anterior guidance. It disrupts the habitual path of closure by removing the guiding effect of the cuspal inclines. It causes an immediate and pronounced relaxation in the masticatory muscles, which will eventually result in the mandible repositioning and closing in orthopaedically stable position or centric relation.¹⁰ Verticalization splint was used initially to maintain comfortable neuro-musculature and relieve all occlusal interferences at established VDO. The sectional occlusal splint as used in above case additionally served as the guide to maintain the planned vertical dimension during teeth preparations and provisional restorations.

The time period for wearing an occlusal splint and/or provisional crowns with increased vertical dimensions ranges

between three weeks to six months.^{12,13} The effectiveness of the occlusal splint is determined clinically. The purpose in this case has though been magnified, but its primary purpose was to evaluate the amount of increase in vertical dimensions that could be tolerated. Patients with occlusal wear of the permanent dentition tend to tolerate increase in vertical dimensions very well, provided the increase is within the physiological limits of the orofacial musculature and mandibular opening. In cases where vertical dimensions of occlusion encroach upon the relaxed contractile length of the muscle fibres, especially those of muscles of mastication, any treatment involving an increase in vertical dimensions is sure to fail.¹⁴ Clinical determination of adequate interocclusal distance and speaking space are good indicators of whether the increase in vertical dimension will be tolerated or not. It is a good exercise that the maximum limit of tolerable increased vertical dimensions is determined as in this case it was found to be 3-4 mm and the actual increase in the vertical dimensions was not done by more than 3 mms. A buffer of 0.5-1 mm or more will always result in better patient compliance. Among the materials available to make the occlusal splint heat cure acrylic resins was preferred to minimize the errors as a result of polymerization shrinkage. Minimal changes in the splint are desired otherwise errors in the fit and mounting of casts could occur. Full mouth rehabilitation is not only an extensive restorative procedure, but also psychologically and physically very demanding on the part of the patient specially in simultaneous arch technique.¹⁵ In the above case segmental technique was used which helped in maintaining vertical dimension as planned at all stages. The technique utilizing the existing splint as a guide for full mouth rehabilitation offers the advantage of incorporating the exact amount of increase in vertical dimensions as tolerated by the patient. Unnecessary arbitrary adjustment of vertical pin on the articulator is thus eliminated as in conventional method. During the full mouth rehabilitation procedure, one needs to frequently mount the maxillary and mandibular casts many times using the face bow index and adjusting vertical pin of an articulator. The above technique also allows the clinician to make interocclusal records directly on the modified splint thereby inheriting stability to the interocclusal record itself and thus avoiding the errors induced by re-articulation.

CONCLUSION

The above-mentioned technique allows clinician to restore VD in a more conservative and reversible manner. This technique allows clinician to transfer the verified vertical dimensions of occlusion through occlusal splint to his final restorations. Care is therefore required to ensure that the diagnostic occlusal splint remains physically and chemically stable throughout the procedure. Proper instructions regarding the fabrication, wearing and maintenance of the occlusal splint are mandatory.

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